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Title

Oral health-related quality of life improves in employees with disabilities following a workplace dental intervention

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ABSTRACT

This pilot study evaluated a dental intervention for employees with disabilities by measuring changes in self-rated oral health, dental behaviours and oral health-related quality of life (OHRQol). Consenting employees with disabilities (≥ 18 years) at two worksites in South Australia underwent dental examinations at baseline, three and six months. Referrals were arranged as needed to public dental clinics. At one and two months a dental hygienist provided group oral health education to the employees. Employees' demographics, self-rated oral health, dental behaviours and OHRQol were collected via face-to-face interviews. Of the 39 referred employees, 28 (72%) of them completed the recommended treatment. Self-rated oral health improved and there were significant reductions in the prevalence of oral health impact on quality of life (percentage of employees reporting 1+ items fairly/very often) from 27% to 11% (McNemar's test, $p<0.05$); the extent of impact (mean number of items reported fairly/very often) from 1.3 to 0.6 and the severity of impact (mean of summed OHIP item scores) from 3.6 to 1.8 (paired t tests, $p<0.01$). As this pilot study indicates that enabling urgent referral for treatment and regular oral health education can improve OHRQol and self-rated oral health among employees with disabilities, a larger study with a control group should be undertaken.

Keywords

Oral health-related quality of life; dental behaviour; dental intervention; disability

Abbreviations

ADHD, Attention Deficit Hyperactivity Disorder; ARCPOH, Australian Research Centre for Population Oral Health; OHIP, Oral Health Impact Profile; OHRQoL, Oral Health-Related Quality of Life

Highlights

- A workplace dental intervention was evaluated as a pilot study.
- Changes evaluated were self-rated oral health, dental behaviours, and oral health-related quality of life (OHRQoL).
- Self-rated oral health improved.
- Prevalence, extent and severity of impacts on OHRQoL showed significant reductions.
- Referral for treatment combined with dental education can be beneficial to employees.

Introduction

Although oral diseases are rarely life-threatening, they do impact on overall health, nutrition and wellbeing (Gift & Atchinson, 1995). Poor oral health can lead to pain, difficulty eating, sleep disturbance, and decreased self-esteem, all of which can have adverse impacts on an individual's quality of life (Locker & Allen, 2007). These impacts are more common among people with special needs than in the general population (Anders & Davis, 2010), an inequality which is compounded by poor access to oral health care. Australia's National Oral Health Plan 2004–2013 (National Advisory Committee on Oral Health, 2004) identified 'people with special needs' as a priority in 'Action Area Five', defining them broadly as "people with physical and intellectual disability, or medical or psychiatric conditions that increase their risk of oral health problems or increase the complexity of oral health care". Yet this remains the only identified group in the Plan for which there no national population-based data, probably due to both its heterogeneity and difficulties with access to individuals and their consent. Oral health knowledge among this group and their carers is also documented as relatively poor (Pradhan, 2013; Pradhan, Keuskamp & Brennan, 2015). Consequently, patients with special needs often require emergency treatment for oral disease involving hospital admissions and general anaesthesia (National Advisory Committee on Oral Health, 2004). In Australia, the public sector offers dental care to those who are eligible by virtue of lower income, but resource constraints mean there are significant waiting times for treatment, and less emphasis on preventive care (Brennan, Luzzi, & Roberts-Thomson, 2008). This pilot study evaluates an intervention focussed on oral health education and urgent treatment for a group of people with special needs in South Australia.

In a previous South Australian study (2004-2007), a mailed questionnaire to carers was used to estimate oral health-related quality of life (OHRQol) among adults with physical and intellectual disabilities (Pradhan, 2013). Carers recorded relatively low prevalences of four impacts from oral conditions - trouble sleeping, pain and discomfort, unsatisfactory diet and irritability. However, the impacts may have been underestimated by carers, as was determined in a retrospective French study (Hennequin, Faulks, & Roux, 2000). Nonetheless, carers have also emphasised the social implications of oral health of dependent people with disabilities in qualitative studies, with comments like "…the only thing that does put you off is bad breath" (Weeks & Fiske 1994). Those with special needs who are more independent, such as those who are employed, can self-consent to research and self-report on their health. Hall, Chapman, and Kurth (2013) surveyed 433 adults with Social Security-determined disabilities enrolled in the Kansas Working Healthy project. Compared with the US population, the sample had significantly greater prevalence of painful aching, uncomfortable eating, and difficulty working due to dental problems.

Only a small number of studies have measured the impact of dental treatment and/or education on the oral health of people with disabilities. Fiske, Gelbier, and Watson (1990) measured the contribution of dental care to OHRQol by using four categories of oral disadvantage (impairment of function, comfort, self-image and social interaction) among older adults in the UK. They found that the greatest post dental treatment gains were in self-image and social interaction. An uncontrolled study from Israel found that regular dental treatment and oral health education improved the oral health status of 39 institutionalised young people but concluded that behavioural change was impeded by

the lack of staff engagement (Mann, Wolnerman, Lavie, Carlin, Meir, & Garfunkel, 1986).

Workplaces offer a number of benefits as sites of oral health promotion for employers, employees and the dental profession (Schou, 1989). Workplace-based oral health education and/or referral has been shown to benefit individuals' oral health and reduce their health expenditure in the general working population (Fishwick, Ashley, & Wilson, 1998; Ide, Mizoue, Tsukiyama, Ikeda, & Yoshimura, 2001). In addition to its impacts on quality of life, poor oral health is likely to affect workplace productivity and inhibit work incentive projects aimed at increasing the independence of people with disabilities. One controlled intervention of 382 adults with intellectual disabilities attending adult training centres has been reported from the UK (Shaw & Shaw 1991). They showed that trainees were able to improve their oral hygiene and periodontal condition if they received regular educational input from a dental hygienist. Yet, there is to our knowledge no published data in Australia on oral health-related interventions for employees with disabilities. The aim of this pilot study was to evaluate a workplace intervention (dental education and referral for treatment) for employees with disabilities by reporting changes in self-rated oral health, dental behaviours and OHRQol.

Methods

To overcome some of the challenges to data collection often encountered when involving people with disabilities, two workshops were conducted jointly by the South Australian Dental Service and the Australian Research Centre for Population Oral Health (ARCPOH) involving managers and carers of disability organizations and dental professionals involved in the dental care for adults with disabilities. One organization

was identified as providing employment for people with physical and/or intellectual disability referred hereafter as ‘employees’ for this study.

Employees (≥ 18 years) at two worksites in Adelaide were approached via mail to participate in the study, and then followed up by their managers. A dentist and a dental recorder conducted face-to-face interviews at baseline, 3 months and 6 months to collect information on pre- and post-test questionnaires about employees’ age, sex, living arrangement, period since last dental visit, type of disability, toothbrushing frequency, consumption of sweetened food and drink, and self-rated oral health. OHRQol was also assessed using 14 questions selected primarily from the Oral Health Impact Profile (OHIP-14) (Slade, 1997). OHIP items ask about the frequency of adverse impacts caused by oral conditions during the previous 12 months, e.g. 'How often during the past year have you had painful aching in your mouth because of problems with your teeth, mouth or dentures?' Responses were on a five-point ordinal scale ranging from 'very often' to 'never'. Only four questions were selected for the South Australian study on dependent adults with disabilities, as observable domains like function (problems eating) or social issues (irritability) are more likely to be validly assessed by proxy carers (Pradhan, 2013). As this study included independent adults with disabilities who could communicate, all the items of the OHIP-14 (Slade, 1997) were used but with a few changes. Some items were combined (‘has your diet been unsatisfactory’ and ‘have you found it uncomfortable to eat any foods’; ‘have you been self-conscious’ and ‘a bit embarrassed’) so that two items regarding bad breath and interrupted sleep could be added, retaining 14 questions in total. The added items were sourced from the long-form version, OHIP-49 (Slade & Spencer, 1994), and reflected the oral impacts more observable to people with disabilities that had been highlighted in previous research. As

suggested by MacEntee (2007) any comments provided by the employees on the dental intervention were also included in the evaluation.

One dentist (AP) examined all consenting employees at baseline. Referrals were arranged as needed to the SA Dental Service clinic closest to the employee's residence or workplace. In most cases, employees were seen urgently, i.e. within one month, and were not waitlisted as they usually would have been. At one month and two months a dental hygienist provided group oral health education to the employees. The dental hygienist had attended an oral health training program provided by AP to carers of people with disabilities (Pradhan, Keuskamp & Brennan, 2015). The oral health education included toothbrushing behaviours using a demonstration model, reinforcement of healthy diet and the importance of regular dental visiting, in a simple language that could be understood by the employees. At three months, the dentist re-examined the employees, noting any changes in oral health, reinforcing daily oral care and reminding employees of dental treatment needs. At six months, follow-up dental examinations were completed by the same dentist (AP).

Analysis

Analysis of OHIP items was based on analysis of OHIP-14 in the study by Slade, Nuttall, Sanders, Steele, Allen and Lahti (2005). Values for each item were re-coded to 0 for a response of 'never' to 4 for a response of 'very often'. Three summary variables were then computed:

Prevalence: the percentage of people reporting one or more items 'fairly often' or 'very often'.

Extent: the number of items reported 'fairly often' or 'very often' (range 0 – 14).

Severity: the sum of ordinal responses (range 0 to 56).

Bivariate data analyses were conducted with SPSS version 20. McNemar and paired t-tests were used to compare pre- and post-intervention results.

Results

When 200 employees at two worksites were approached via mail to participate in the intervention, only two responses were received. When approached via managers at the worksites, responses increased to 26, and the number of participants at baseline eventually reached 51, facilitated by word of mouth. As this sample size was not sufficient to support a control group, the intervention was applied to the entire sample. Consequently, the study was treated as a pilot with which to estimate effect size for a larger, controlled study at a future time. These 51 consenting employees underwent dental examinations by a dentist. At six months, seven employees had either left the job or were on leave for a long period of time due to ill health, effecting a final sample of 44 who completed pre- and post-test questionnaires (Table 1).

Loss to follow-up tended to be from youngest or oldest age groups, females and those living alone. Of the 44 employees who completed the study, about 50% were 35–54 years old and 68% were male. Almost two thirds lived with family, the remainder living alone. The main disabling condition was intellectual, with 34% of participants affected by both intellectual and physical disabilities. Intellectual disabilities included Down's syndrome, Attention Deficit Hyperactivity Disorder (ADHD) and learning disabilities. Physical disabilities included arthritis, brain and back injuries, and hearing impairment. All employees could communicate verbally, with the exception of one who could only lip read. Most were able to brush their teeth and eat without assistance, with only two

needing assistance with toothbrushing and one needing assistance with eating. Only 27% of employees had visited a dentist within the last year.

The baseline dental examination revealed that 39 (89%) of the employees needed dental treatment and were referred to the closest SA Dental Service community dental clinic. Clinic staff assisted the intervention team by contacting the referred employees by phone to offer an appointment within a short time frame, posting out their appointment card, sending text reminders, and following up any employees who failed to attend their appointment. Of the 39 of the employees who were referred, 28 (72%) completed the recommended treatment, which ranged from teeth cleaning to extraction of all existing teeth. Six employees said they had not received their dental appointments. Four employees did not attend due to dental fear and costs. One had been given a dental appointment but had not received care by the time of follow-up.

Table 2 shows the frequency of perceived negative impacts on OHRQoL reported by employees pre- and post-intervention. At baseline, about 11% of employees reported the negative impacts of painful aching and unsatisfactory diet, 9% had trouble sleeping, and about 5% had difficulty relaxing and bad breath. Frequency of other negative impacts was low, and no employees reported trouble pronouncing words, interrupted meals, difficulty doing usual jobs or being totally unable to function because of oral health problems. The frequency of all impacts reduced by follow-up.

All three measures of OHRQol improved from baseline to follow-up (Table 3). The proportion of employees self-rating their oral health as fair or poor reduced significantly from 64% to 34% (McNemar's test, $p<0.001$). Although overall 27% of employees reported one or more items as 'fairly often' or 'very often' (Table 3), the extent and

severity of impact were low, given their potential range from 0 - 14 and 0 - 56, respectively. There were significant reductions in the prevalence of impact (the percentage of people reporting one or more items reported fairly/very often) from 27% to 11% (McNemar's test, $p<0.05$), the extent of impact (mean number of OHIP items reported fairly/very often) from 1.3 to 0.6, and the mean of summed OHIP item scores from 3.6 to 1.8 (both paired t tests, $p<0.01$).

Table 4 presents self-rated oral health and OHRQoL findings stratified by age group, sex and whether employee completed treatment. Consistent differences were seen between the two age groups in the extent of change of all variables: the older group improved more than the younger. For example, the percent of employees with poor self-rated oral health decreased from 55% to 21% for those 35 years and over, and from 80% to 60% for the younger group. A closely similar pattern was evident for groups defined by treatment: those who completed treatment exhibited more improvement in oral health than those who did not. For example, poor self-rated oral health decreased from 57% to 18% for those treated, and 75% to 63% for those who were not. There were no consistent differences between sexes in the measured change of variables.

Prior to the intervention, only 34% of the employees brushed their teeth at the recommended frequency of twice a day (Table 5). At six months, the frequency of toothbrushing twice a day had increased, but only to 50%. The consumption of sweet drinks and sweet solids was relatively stable with acidic drink consumption decreasing the most, from 50% to 34% (all $p > 0.05$). However, some of the qualitative feedback from employees included the comment: "Made changes in life with improved dental health from this study". Anecdotal evidence also indicated that there were positive changes in some behaviours, as some employees quit smoking; others acknowledged not only improvement in their oral health but also financial and social gains. These employees shared their success stories with non-participating employees and helped to promote healthy behaviours at the workplace. The workplace manager noted some employees replacing soft drinks with water during their breaks.

Discussion

This pilot study provides preliminary evidence that providing regular oral health education and enabling referral to treatment improves self-rated oral health and OHRQol among employees with disabilities. Owing to the smaller than anticipated sample size, we did not employ a control group in the study design. We acknowledge the limited capacity of such a quasi-experimental design to discern a causal effect. The principal critique is that any association between intervention and outcomes could be attributed to confounding factors or Hawthorne effect (Cook & Campbell, 1979). Hence, the outcomes cannot be attributed unambiguously to the intervention, as confounding variables may be responsible for the cause-effect relationship. The intervention combined oral health education and clinical treatment, and we acknowledge that disentangling their effects is problematic. However, stratifying the outcomes by treatment did indicate that it was this component of the intervention that was most responsible for the observed improvements in oral health.

Nonetheless, the group that undertook treatment were younger and reported worse oral health at baseline.

In contrast to the main finding, no observable change was measured in oral health behaviours, namely toothbrushing frequency and consumption of sweet food and drink. However, there was anecdotal evidence of some improvements. Other studies have highlighted the challenges in changing oral health behaviours for this subpopulation (Binkley, Johnson, Abadi, Thompson, Shamblen *et al.*, 2014; Pradhan, Keuskamp & Brennan, 2015), and more intensive efforts would likely be required than were employed in this study. For the general population, systematic reviews of the evidence for oral health promotion effectiveness have not been definitive. They have highlighted that gains in knowledge were more readily achieved than behavioural change, and there was little evidence for clinical impact (Kay, & Locker, 1998; Satur, Gussy, Morgan, Calache, & Wright, 2010). Moreover, Kay & Locker (1998) found that chairside health promotion was most effective, highlighting the importance of regular dental visiting already suggested by this study's findings.

Despite their physical and/or intellectual disabilities, over a third of the employees lived alone, independently. Even those who reported living with families were living with a partner with physical and/or intellectual disabilities. While some studies have used self-completed questionnaires, in this pilot study, a dentist and dental recorders conducted face-to-face interviews as the employees were not able to complete questionnaires by themselves. A modified version of OHIP-14 (Slade, 1997) was used that sourced additional items from OHIP-49. The frequency of perceived negative impacts reported by employees justified the use of more observable domains (pain, unsatisfactory diet, trouble sleeping, and bad breath) for people with physical and intellectual disabilities.

The prevalence of oral health impacts on quality of life among employees with disabilities was high (27%), relative to estimates from the general UK population (16%) and Australian dentate adults (18%) (Slade, Nuttall, Sanders, Steele, Allen and Lahti, 2005). However, severity of impact was low, perhaps reflecting this subpopulation's perspective on pain, i.e. documented higher pain threshold and/or that many live with chronic pain (Symons, Shinde, & Gilles, 2008). Nonetheless, the prevalence, extent and severity of impacts all showed significant reductions following the intervention. Likewise, self-reported oral health had improved significantly. Clinical outcomes were also measured for the employees and will be reported separately.

Most of the employees (72%) completed the recommended dental treatment, and benefitted from doing so. Nonetheless, dental fear remained a barrier to accessing dental services for some employees, as reported for other patients with special health care needs (Gordon, Dionne, & Snyder,1998). Even in the general population, high dental fear is reported to affect one in six Australian adults (Armfield, Spencer, & Stewart, 2006). Although employed, these employees would be on minimal wages. Given ample evidence about cost as a barrier to care for the general population (Spencer & Harford, 2007), it is not surprising that it was cited as a reason for non-attendance in this study. Patients of the South Australian Dental Service paid fees to a maximum of AUD$155 for a general dental course of care in South Australia in 2015-6, with additional payment for denture services (South Australian Department of Health, 2015). Notably, only 27% of employees at baseline had visited a dentist within the last year, less than half the Australian national estimate of 59.3% (Spencer & Harford, 2007) and closer to estimates for other disadvantaged populations such as the homeless (Ford, Cramb, & Farah, 2014). The benefits suggested by dental treatment in this study further underline the importance of routine dental care for the subpopulation of people with special

needs, as has been demonstrated in several studies for the general population (Crocombe, Brennan, & Slade, 2011) and older adults (Gagliardi, Slade, & Sanders, 2008; Locker, 2001).

Conclusions

This pilot study indicates that enabling urgent referral for treatment and regular oral health education can improve OHRQol of employees with disabilities with significant reductions in the prevalence, extent and severity of impacts following a workplace intervention. Self-rated oral health among employees also improved. Given the limitations inherent in an uncontrolled pilot study, the authors acknowledge it is a 'stepping stone' and ideally a larger study with a control group should be undertaken.

Lessons learned

Valuable information was gained from this evaluation that will assist planning in organizations involved with disabilities, the dental profession and service providers. This study has again highlighted the challenges in conducting research with people with disabilities, and resulted in a small, convenience, non-representative sample. Direct approach by managers (enhanced by word of mouth), at worksites, day centres or respite services, is likely to be a more effective alternative to direct mailing for recruitment of this sub-population in future research. Cooperation of staff at the worksites and dental service providers proved to be essential to the success of the intervention, as others have found (Mann, Wolnerman, Lavie, Carlin, Meir, & Garfunkel, 1986). Unfortunately, slow response and low participation did not allow for a control group, which would have enabled us to attribute the observed changes to the intervention with less ambiguity.

The combination of regular onsite dental examinations by a dentist, group oral health education by a dental hygienist and referral for treatment was beneficial to most employees.

However, identification of dental anxiety and cost as barriers to clinical care indicates a need for developing more direct dental care delivery systems for this subpopulation. Partnerships formed during this pilot study with stakeholders like disability organizations and the South Australian Dental Service could be consolidated for future collaborations in expanding this pilot study to a number of workplaces or day options. This would provide a stronger evidence base for the establishment and effectiveness of workplace dental projects, and contribute to improving the oral health of people with disabilities in Australia, a disadvantaged group.

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Vitae

Include in the manuscript a short (maximum 100 words) biography of each author.

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She is a Senior Lecturer at The University of Queensland. She has been involved with several research projects on older adults, Special Olympics athletes, and people with disabilities and their carers. She has presented and published papers at several national and international conferences and journals. As the lead for People with Disabilities, Australia's National Oral

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Dr Dominic Keuskamp is a Research Associate at the Australian Research Centre for Population Oral Health (ARCPOH) at the University of Adelaide. He is a public health researcher with an interdisciplinary background in ecology and education. Current research interests include community-based interventions to improve the oral health of older people and those with disabilities. He has also published in the impact of precarious forms of employment on mental and physical health, and the role played by psychosocial factors as mediators.

Professor David Brennan has expertise in dental health services research and health-related quality of life. He currently heads the Health Services Research Unit at the Australian Research Centre for Population Oral Health at the University of Adelaide. He has published over 100 articles in scientific journals, served on editorial boards and as an associate editor, and been a member of NHMRC peer review panels. His research has been funded by the Australian National Health and Medical Research Council through a Public Health Scholarship, Career Development Fellowship, Project grants, Partnership grant, and Centre for Research Excellence grant.

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Table 1 Characteristics of employees at baseline

Employee Characteristics	n [%] [1]	n (loss to follow-up)
Age		
18-34	15 (34)	3
35-54	24 (55)	1
55+	5 (11)	3
Sex		
Female	14 (32)	5
Male	30 (68)	2
Living arrangement		
With family	28 (64)	3
Alone	16 (36)	4
Australian indigenous origin		
Yes	1 (2)	0
No	43 (98)	7
Disabling condition		
Intellectual disability	34 (77)	1
Physical disability	25 (57)	4
Last dental visit		
Less than 12 months ago	12 (27)	2
1–2 years ago	8 (18)	1
2– 5 years ago	8 (18)	1
Never/don't know	16 (36)	3

[1] n=44 employees who completed pre- and post-test questionnaires

Table 2 Frequency of perceived negative impacts on OHRQoL reported by employees pre and post dental intervention

	% of employees reporting negative impact (fairly/very often)	
Impact	**Pre**	**Post**
Painful aching	11.4	0.3
Unsatisfactory diet (uncomfortable to eat)	11.4	0.3
Trouble sleeping	9.1	0.2
Difficult to relax	4.5	0.1
Bad breath	4.5	0 .1
Been a bit self-conscious/embarrassed	2.3	0.1
Felt tense	2.3	0.1
Irritable behaviour	2.3	0.1
Sense of taste has worsened	2.3	0.1
Felt life in general was less satisfying	2.3	0.1
Trouble pronouncing any words	0	0
Had to interrupt meals	0	0
Difficulty doing usual jobs	0	0
Been totally unable to function	0	0

Table 3 Changes in self-rated oral health and OHRQoL

	Pre	Post	*P* value
Self-rated oral health (% fair/poor)	64%	34%	<0.001[a]
OHRQoL			
Prevalence: % of people reporting 1+ impacts fairly/very often	27%	11%	0.008[a]
Extent: mean no. of items reported fairly/very often (SE)	1.3 (0.3)	0.6 (0.2)	0.013[b]
Severity: mean summed OHIP items scores (SE)	3.6 (0.9)	1.8 (0.4)	0.008[b]

[a]McNemar's test
[b]Paired t test

Table 4 Self-rated oral health and OHRQoL stratified by treatment, age and sex

		Percent **Not treated, 16**	***P-value***	***Percent*** **Treated, 28**	***P-value***
OHIP items prevalence	Pre	50%	0.5[a]	46%	0.031[a]
	Post	38%		25%	
Self-rated oral health (poor)	Pre	75%	0.5[a]	57%	0.001[a]
	Post	63%		18%	
		Mean (SE) **Not treated,16**	***P-value***	***Mean (SE)*** **Treated, 28**	***P-value***
Self-rated oral health (continuous)	Pre	3.9 (0.3)	0.188[b]	3.6 (0.1)	< 0.001[b]
	Post	3.7 (0.3)		3.0 (0.1)	
OHIP items severity	Pre	4.1 (1.7)	0.192[b]	3.4 (1.0)	0.018[b]
	Post	2.3 (0.7)		1.5 (0.5)	
OHIP items extent	Pre	1.7 (0.7)	0.192[b]	1.1 (0.3)	0.013[b]
	Post	0.8 (0.3)		0.5 (0.2)	
		Percent **Age 18-34, 15**	***P-value***	***Percent*** **Age 35+, 29**	***P-value***
OHIP items prevalence	Pre	53%	0.5[a]	45%	0.031[a]
	Post	40%		24%	
Self-rated oral health (poor)	Pre	80%	0.25[a]	55%	0.002 [a]
	Post	60%		21%	
		Mean (SE) **Age 18-34, 15**	***P-value***	***Mean (SE)*** **Age 35+, 29**	***P-value***
Self-rated oral health (continuous)	Pre	3.9 (0.2)	0.096[b]	3.6 (0.2)	< 0.001[b]
	Post	3.6 (0.2)		3.1 (0.2)	
OHIP items severity	Pre	4.1 (1.7)	0.217[b]	3.4 (0.9)	0.016[b]
	Post	2.3 (0.7)		1.5 (0.5)	
OHIP items extent	Pre	1.7 (0.8)	0.220[b]	1.1 (0.3)	0.011[b]
	Post	0.8 (0.3)		0.5 (0.2)	
		Percent **Female, 14**	***P-value***	***Percent*** **Male, 30**	***P-value***
OHIP items prevalence	Pre	43%	0.25[a]	50%	0.063[a]
	Post	21%		33%	
Self-rated oral health (poor)	Pre	43%	0.5[a]	73%	0.001[a]
	Post	29%		37%	
		Mean (SE) **Female,14**	***P-value***	***Mean (SE)*** **Male, 30**	***P-value***
Self-rated oral health (continuous)	Pre	3.5 (0.2)	0.028[b]	3.8 (0.2)	.001[b]
	Post	3.1 (0.2)		3.3 (0.2)	
OHIP items severity	Pre	3.1 (1.2)	0.069[b]	3.9 (1.1)	.047[b]
	Post	1.1 (0.6)		2.0 (0.5)	
OHIP items extent	Pre	1.2 (0.5)	0.051[b]	1.4 (0.4)	.072[b]
	Post	0.4 (0.3)		0.6 (0.2)	

[a]McNemar's test**;** [b]Paired t test

Table 5 Changes in oral health behaviours of employees

Oral health behaviours	Baseline n (%)	Follow-up n (%)	*p*-value (McNemar's test)
Toothbrushing frequency			

Twice a day	15 (34)	22 (50)	0.142
Once a day or less	29 (66)	22 (51)	
Dietary consumption			
Sweet drink (mod-high)	34 (77)	35 (80)	> 0.999
Sweet solids (mod-high)	11 (25)	8 (18)	0.453
Acidic drinks (mod-high)	22 (50)	15 (34)	0.167